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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/691,434	08/02/1996	SHUNPEI YAMAZAKI	0756-1551	2240

31780 7590 08/13/2002

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EXAMINER	
WILCZEWSKI, MARY A	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 08/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
08/691,434	Yamazaki et al.
Examiner	**Art Unit**
Mary Wilczewski	2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *THREE (3)* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *May 17, 2001* .

2a) ☒ This action is **FINAL.** 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *16-20, 24, 25, 56-61, and 74-91* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *16-20, 24, 25, 56-61, and 74-91* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☒ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. *08/160,909* .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). *67*
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 08/160,909, filed on February 18, 1994.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 16-20, 24, 25, 80 and 86 are rejected under 35 U.S.C. 103(a) as being unpatentable over Begin et al. in view of Miyachi et al., Nakayama et al., and Kawasaki et al., further in view of Codama, all of record, further in view of Pressley, U.S. Patent 4,475,027, further in view of Kawachi et al., the article entitled "Large-Area Process for Fabrication of Poly-Si Thin Film Transistors Using Bucket Ion Source and XeCl Excimer Laser Annealing", newly cited.

Begin et al. disclose an apparatus for processing semiconductor wafers which includes satellite reaction chambers 60, 62, 64, and 66 disposed around the periphery of central chamber 14, see figure 1. A robot assembly 16 comprising arms 18, 20, and 22 is disposed in central chamber 14. Assembly 16 moves the substrate 12 to any position within the apparatus. Begin et al. lack anticipation only of disclosing that reaction chambers 60, 62, 64, and 66 comprise an ion introducing apparatus and a laser processing apparatus. However, apparatuses used for irradiating an amorphous silicon layer for dehalogenating and hydrogenating the layer, etching, and plasma doping are well known in the art, see Miyachi et al., Kawasaki et al., and Nakayama et al., respectively.

Miyachi et al., in particular, disclose an apparatus which comprises a film-forming chamber 1 for forming an amorphous semiconductor film and a dehalogenating-hydrogenating chamber 2, see figure 5, for example. The two chambers are combined by a conveying device 13. The substrates 10 move between the two chambers without being exposed to outside air. Note in Example 14 that the dehalogenation-hydrogenation is preferably performed in a processing chamber by light irradiation using, for example, an ultraviolet laser, a visible light laser, or a carbon dioxide laser, see column 18, lines 29-43. Miyachi et al. lack anticipation only of using a rectangular-shaped laser beam having an elongated cross-section and of moving the substrate in a direction orthogonal to the laser beam during the irradiating step.

Pressley discloses an laser processing apparatus which comprises a rectangularly-shaped laser beam in which the laser beam is scanned by moving the beam relative to the substrate, see column 7, lines 4-9. Since the apparatus of Pressley permits uniform laser irradiation of semiconducting materials, it would have been obvious to one of ordinary skill in the art to use a laser beam having a rectangular cross-section in the dehalogenating-hydrogenating chamber of Miyachi et al. In addition, it is obvious from the teachings of Pressley that the substrates could be alternatively moved with respect to the laser beam in the known apparatus of Miyachi et al.

Codama discloses a method of fabricating a thin film transistor which includes the steps of depositing an amorphous silicon layer; etching the silicon layer, the gate layer and the gate insulating layer; plasma doping the silicon layer to form source and drain regions, see column 1, lines 42-46; and hydrogenating the silicon layer. Therefore, in light of the semiconductor device manufacturing process of Codama, it would have been obvious to the skilled artisan to include a laser processing apparatus and an ion introducing apparatus in the known multi-chambered apparatus of Begin et al. in order to fabricate the thin film transistor of Codama.

Although Codama teaches plasma doping of a semiconductor film, Codama fails to anticipate the use of an ion introducing apparatus comprising a grid electrode around which a dopant is made a plasma and accelerated toward the semiconductor layer. However, a plasma doping apparatus which comprises a grid electrode is known in the art, as taught by Kawachi et al., see Fig. 1. In addition, Kawachi et al. teach the activation of the implanted ions by laser

annealing. Since Kawachi et al. teach that the disclosed ion introducing apparatus is applicable to polycrystalline thin film transistors and permits large-area implantation, it would have been obvious to one skilled in the art to include the ion introducing apparatus of Kawachi et al. in the known multi-chambered apparatus of Begin et al. in order to perform large-area doping or polysilicon in the fabrication of the device of Codama. Since Kawachi et al. teach laser annealing of the dopants implanted using the disclosed large-area doping apparatus shown in Fig. 1, it would have been obvious to the skilled artisan to include the ion introducing apparatus of Kawachi et al. in a multi-chambered apparatus that includes a laser irradiation chamber.

Claims 56-61, 81 and 87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Begin et al. in view of Miyachi et al., Nakayama et al., and Kawasaki et al., further in view of Codama, all of record, further in view of Hashizume, JP 03-286518, further in view of Kawachi et al., the article entitled "Large-Area Process for Fabrication of Poly-Si Thin Film Transistors Using Bucket Ion Source and XeCl Excimer Laser Annealing", newly cited.

Begin et al. disclose an apparatus for processing semiconductor wafers which includes satellite reaction chambers 60, 62, 64, and 66 disposed around the periphery of central chamber 14, see figure 1. A robot assembly 16 comprising arms 18, 20, and 22 is disposed in central chamber 14. Assembly 16 moves the substrate 12 to any position within the apparatus. Begin et al. lack anticipation only of disclosing that reaction chambers 60, 62, 64, and 66

comprise an ion introducing apparatus and a laser processing apparatus. However, apparatuses used for irradiating an amorphous silicon layer for dehalogenating and hydrogenating the layer, etching, and plasma doping are well known in the art, see Miyachi et al., Kawasaki et al., and Nakayama et al., respectively.

Miyachi et al., in particular, disclose an apparatus which comprises a film-forming chamber 1 for forming an amorphous semiconductor film and a dehalogenating-hydrogenating chamber 2, see figure 5, for example. The two chambers are combined by a conveying device 13. The substrates 10 move between the two chambers without being exposed to outside air. Note in Example 14 that the dehalogenation-hydrogenation is preferably performed in a processing chamber by light irradiation using, for example, an ultraviolet laser, a visible light laser, or a carbon dioxide laser, see column 18, lines 29-43. Miyachi et al. lack anticipation only of using a rectangular-shaped laser beam having an elongated cross-section and of moving the substrate in a direction orthogonal to the laser beam during the irradiating step.

Hashizume discloses a laser processing apparatus which comprises a laser beam having a rectangular shape in which the laser beam is scanned by moving the beam relative to the substrate, see figure 2 and pages 7-9 of the translation. Note in figure 4, Hashizume shows that a rectangular-shaped laser beam having a width greater than a "substantially" square substrate is scanned along the substrate surface. The use of a rectangularly-shaped laser beam, as in the method of Hashizume, eliminates overlapping regions and permits uniform irradiation

of the silicon layer, see page 7 of the translation. Since the rectangular-shaped laser beam of Hashizume permits uniform laser irradiation of semiconducting materials, it would have been obvious to one of ordinary skill in the art to use a laser beam having a rectangular cross-section in the dehalogenating-hydrogenating chamber of Miyachi et al. In addition, it is obvious from the teachings of Hashizume that the substrates could be moved with respect to the laser beam in the known apparatus of Miyachi et al. It is noted that Hashizume does not disclose the dimensions of either the substrate or laser beam, however, in light of the generic teaching of Hashizume to use a rectangularly-shaped laser beam having a width greater than that of the irradiated substrate, these dimensions are not deemed to patentably distinguish the claimed method from that of Hashizume. In addition, Hashizume discloses a laser beam scanning technique, however, it would have been obvious to one of ordinary skill in the art that, alternatively, the substrate could be moved with respect to the laser beam.

Codama discloses a method of fabricating a thin film transistor which includes the steps of depositing an amorphous silicon layer; etching the silicon layer, the gate layer and the gate insulating layer; plasma doping the silicon layer to form source and drain regions, see column 1, lines 42-46; and hydrogenating the silicon layer. Therefore, in light of the semiconductor device manufacturing process of Codama, it would have been obvious to the skilled artisan to include a laser processing apparatus and an ion introducing apparatus in the known multi-chambered apparatus of Begin et al. in order to fabricate the thin film transistor of Codama.

Although Codama teaches plasma doping of a semiconductor film, Codama fails to anticipate the use of an ion introducing apparatus comprising a grid electrode around which a dopant is made a plasma and accelerated toward the semiconductor layer. However, a plasma doping apparatus which comprises a grid electrode is known in the art, as taught by Kawachi et al., see Fig. 1. In addition, Kawachi et al. teach the activation of the implanted ions by laser annealing. Since Kawachi et al. teach that the disclosed ion introducing apparatus is applicable to polycrystalline thin film transistors and permits large-area implantation, it would have been obvious to one skilled in the art to include the ion introducing apparatus of Kawachi et al. in the known multi-chambered apparatus of Begin et al. in order to perform large-area doping or polysilicon in the fabrication of the device of Codama. Since Kawachi et al. teach laser annealing of the dopants implanted using the disclosed large-area doping apparatus shown in Fig. 1, it would have been obvious to the skilled artisan to include the ion introducing apparatus of Kawachi et al. in a multi-chambered apparatus that includes a laser irradiation chamber.

Claims 74-79, 82-85, and 89-91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Begin et al. in view of Miyachi et al., Nakayama et al., and Kawasaki et al., further in view of Codama, all of record, further in view of Kawachi et al., the article entitled "Large-Area Process for Fabrication of Poly-Si Thin Film Transistors Using Bucket Ion Source and XeCl Excimer Laser Annealing", newly cited.

Begin et al. disclose an apparatus for processing semiconductor wafers which includes satellite reaction chambers 60, 62, 64, and 66 disposed around the periphery of central chamber 14, see figure 1. A robot assembly 16 comprising arms 18, 20, and 22 is disposed in central chamber 14. Assembly 16 moves the substrate 12 to any position within the apparatus. Begin et al. lack anticipation only of disclosing that reaction chambers 60, 62, 64, and 66 comprise an ion introducing apparatus and a laser processing apparatus. However, apparatuses used for irradiating an amorphous silicon layer for dehalogenating and hydrogenating the layer, etching, and plasma doping are well known in the art, see Miyachi et al., Kawasaki et al., and Nakayama et al., respectively.

Miyachi et al., in particular, disclose an apparatus which comprises a film-forming chamber 1 for forming an amorphous semiconductor film and a dehalogenating-hydrogenating chamber 2, see figure 5, for example. The two chambers are combined by a conveying device 13. The substrates 10 move between the two chambers without being exposed to outside air. Note in Example 14 that the dehalogenation-hydrogenation is preferably performed in a processing chamber by light irradiation using, for example, an ultraviolet laser, a visible light laser, or a carbon dioxide laser, see column 18, lines 29-43. Miyachi et al. lack anticipation only of using a rectangular-shaped laser beam having an elongated cross-section and of moving the substrate in a direction orthogonal to the laser beam during the irradiating step.

Codama discloses a method of fabricating a thin film transistor which includes the steps of depositing an amorphous silicon layer; etching the silicon layer, the gate layer and the gate insulating layer; plasma doping the silicon layer to form source and drain regions, see column 1, lines 42-46; and hydrogenating the silicon layer. Therefore, in light of the semiconductor device manufacturing process of Codama, it would have been obvious to the skilled artisan to include a laser processing apparatus and an ion introducing apparatus in the known multi-chambered apparatus of Begin et al. in order to fabricate the thin film transistor of Codama.

Although Codama teaches plasma doping of a semiconductor film, Codama fails to anticipate the use of an ion introducing apparatus comprising a grid electrode around which a dopant is made a plasma and accelerated toward the semiconductor layer. However, a plasma doping apparatus which comprises a grid electrode is known in the art, as taught by Kawachi et al., see Fig. 1. In addition, Kawachi et al. teach the activation of the implanted ions by laser annealing. Since Kawachi et al. teach that the disclosed ion introducing apparatus is applicable to polycrystalline thin film transistors and permits large-area implantation, it would have been obvious to one skilled in the art to include the ion introducing apparatus of Kawachi et al. in the known multi-chambered apparatus of Begin et al. in order to perform large-area doping or polysilicon in the fabrication of the device of Codama. Since Kawachi et al. teach laser annealing of the dopants implanted using the disclosed large-area doping apparatus shown in Fig. 1, it would have been obvious to the skilled artisan to include the ion introducing apparatus of Kawachi et al. in a multi-chambered apparatus that includes a laser irradiation chamber.

Response to Arguments

Applicants' arguments filed May 17, 2002, have been fully considered but they are not persuasive.

Applicants have argued that the Examiner has failed to establish a prima facie case of obviousness. Begin discloses a multi-chambered apparatus which permits the processing of a semiconductor substrate. Admittedly, Begin does not disclose the specific reaction chambers claimed. However, as evidenced by the applied references, the claimed reaction chambers are known in the art. The Codama reference provides motivation for including an ion introducing chamber and a laser processing chamber in the multi-chambered apparatus of Begin, since fabrication of the semiconductor device of Codama requires these processing chambers and including them in the apparatus of Begin permits the fabrication of a semiconductor device without exposing it to air or external impurities which could affect the characteristics of the fabricated device.

It is maintained that the above rejections meet the three basic criteria necessary for establishing a prima facie case of obviousness. First, Codama provides the motivation to modify the apparatus of Begin to include an ion introducing chamber and a laser irradiation chamber. Second, since the apparatus of Begin is intended for processing semiconductor wafers there is a reasonable expectation that it could be used to fabricate the device of Codama. Finally, it is maintained that the applied references teach or suggest every limitation of the instant claims. That is, Begin teach a multi-chambered apparatus in which different processing chambers are connected

to one another via a vacuum chamber and in which a mechanism is provided in the vacuum chamber for transporting the substrate from one processing chamber to another. Various references have been cited as teaching of the various chambers used in the fabrication of semiconductor devices. Finally, Codama has been relied upon as a teaching to include ion introducing and laser processing chambers in the multi-chambered apparatus of Begin, since the fabrication method of Codama requires the use of these processing chambers. Given the benefits of the multi-chambered apparatus of Begin (see columns 1 and 2), it would have been obvious to one skilled in the art to use the multi-chambered apparatus of Begin to fabricate the device of Codama.

It is maintained that the Examiner has presented a prima facie case of obviousness. Hence, the burden of coming forward with evidence or argument shifts to Applicants.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR

1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Wilczewski whose telephone number is (703) 308-2771.

M. Wilczewski
Primary Examiner
Tech Center 2800

MW

August 9, 2002